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The Computer Backgrounds of Soldiers

The computer background of soldiers is changing, a reflection of technological shifts within American society as a whole. But how rapid are these changes and do different segments of the soldier population have distinctly different computer backgrounds? In 1999, the Infantry Forces Research Unit initiated a three-year survey of soldiers to answer these questions.

Soldier Surveys

Each year from 1999 through 2001, soldiers attending four Infantry courses were surveyed: Infantry One Station Unit Training (OSUT), the Basic Noncommissioned Officer Course (BNCOC), the Advanced Noncommissioned Officer Course (ANCOC), and the Infantry Officer Basic Course (IOBC). A total of 2,135 Infantrymen participated. In addition, in 2000 and 2001 soldiers in non-mechanized and mechanized Infantry battalions within Forces Command (FORSCOM) were surveyed. Within a battalion, the surveys were given to one maneuver company, the battalion staff, all medical and field artillery personnel, and one combat engineer platoon for a total of 1,334 soldiers representing seven battalions. The trends reported here focus on the Infantry course trends. The article also cites findings from the FORSCOM sample that confirm these trends, and findings that provide additional insights into soldier computer backgrounds.

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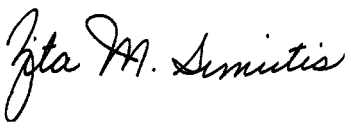
From the Acting Director

The purpose of the ARI Newsletter is to provide the Army with "news you can use." For example, in our lead article, we debunk a myth that entering soldiers are more skilled in computer technology than senior NCOs. We discuss issues related to the use of simulation in training flight skills. We provide data-based recommendations for frequency of retraining on 16 common tasks. And we tell you why filling out those surveys is important to your career as a soldier. These and other articles represent the breadth of our program that supports Army training, leader development, and soldiers. But Newsletters provide only a brief summary of our research findings, focusing on information that can be used every day to improve Army personnel and training capabilities. More in-depth information on ARI research findings can be gained by visiting the ARI website at www.ari.army.mil.

"The soldier is the centerpiece of our formation." — Shinseki



Dr. Zita M. Simutis

The Computer Backgrounds of Soldiers

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The survey concentrated on computer use, ownership, and indicators of skill. Two indices of computer skill were developed. First, soldiers rated their computer expertise on a six-point scale from novice to expert, 'Bill Gates would hire me.' Second, soldiers took a short test where they had to name 18 common Windows-based icons, such as recycle, open file, help, center, and undo. Lastly, soldiers listed the software programs and any programming languages they used.

Computer Ownership

The Infantry course surveys showed an average yearly increase in computer ownership of 5%, starting at 67% in 1999 and ending at 77% in 2001. The ownership trends for each Infantry course are in Table 1. Ownership rates were highest for IOBC and ANCOC, followed by BNCOC, and then OSUT. The greatest increase in ownership was for BNCOC, 20% from 1999 to 2001.

Table 1. Percentage of Infantrymen Owning Computers (Infantry course surveys)

Course	1999	2000	2001
IOBC	81%	81%	79%
ANCOC	78%	81%	90%
BNCOC	60%	68%	79%
OSUT	49%	53%	59%

In the FORSCOM sample, computer ownership also showed an average yearly increase of 5%, 52% to 57% from 2000 to 2001. Privates were the least likely to own computers (36% in 2001). Of the senior NCOs (staff sergeant through sergeant major) 87% owned computers. Of the officers (lieutenant through lieutenant colonel) 96% owned computers.

Computer Use

Use of computers in high school was strongly related to the year when the soldiers were in high school. We estimated the year when the soldiers in each Infantry course would have been in high school at age 17. The youngest groups were the OSUT soldiers in the 2000 and 2001 surveys, with a median age of 19. The oldest group was the ANCOC soldiers in the 1999 survey, with a median age of 34. The relationship between the estimated year in high school and the percentage of soldiers who used computers in high school from the 1980s through the 1990s is shown in Figure 1. Clearly, the percentage increased linearly over this time period. When the ANCOC soldiers were in high school in the early 1980s, only 20% to 25% said they used computers. On the other hand, for the soldiers who attended high school in the late 1990s, typically at least 80% used computers. Moreover, soldiers who recently attended college used computers. For instance, of the lieutenants in IOBC, at least 85% used computers in college.

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Do you believe this statement? "In today's Army, senior noncommissioned officers have weaker computer backgrounds than the young enlisted soldiers."

Figure 1. Linear relationship between estimated year in high school and use of computers in high school (Infantry course surveys).

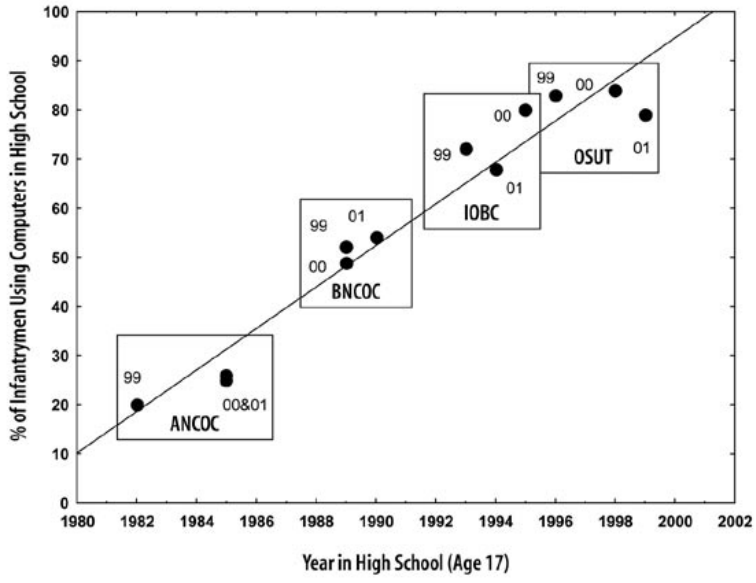

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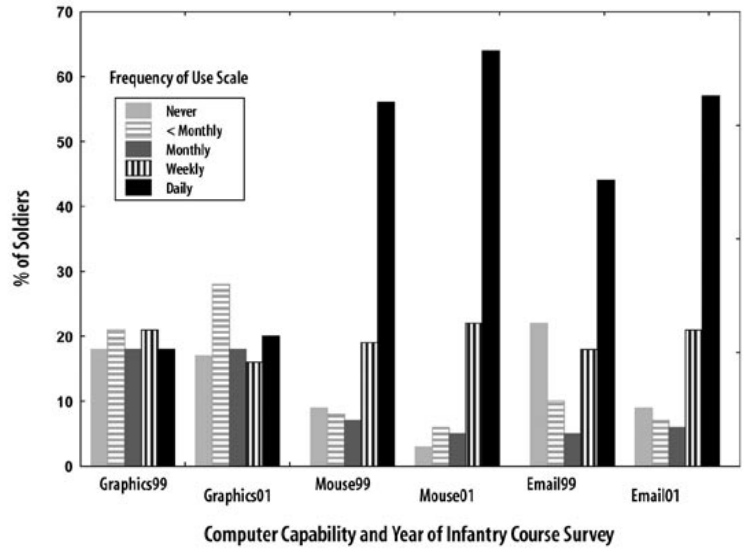
Figure 2. Frequency with which computer features and capabilities were used (Infantry course surveys).



The strong linear relationship between computer use and year in high school was replicated with the FORSCOM sample. The highest usage rate in high school was 91% for the privates in the 2001 FORSCOM survey. At the other extreme were soldiers who had never used computers in high school. These were groups who were at least 40 years old and were in high school in the late 1970s.

In contrast to high school use, which varied with soldier age, current use of computers was relatively high. In the last year of the Infantry course surveys (2001), 96% of the soldiers in BNCOC, ANCOC, and IOBC stated they used a computer, while 86% of OSUT cited usage. In each year, the percentage of soldiers indicating they used a computer was greater than the percentage saying they owned a computer. Home use was very common.

Of special interest was a finding from the FORSCOM surveys conducted in 2000, which showed the impact of the soldiers' work environment on their computer background and experience. We compared corporals/specialists on the battalion staff to those in the maneuver company. These groups had similar backgrounds. They were the same age and the percentage that used computers at home was the same. Over half the corporals/specialists in the battalion staff were Infantry. Despite these similarities, 84% in the battalion staff said they used a computer at work, while only 16% within the Infantry company indicated such use.

We found that soldiers used certain computer features or capabilities more frequently than others. Figure 2 illustrates three frequency-of-use patterns. On the left of Figure 2 is computer graphics; a capability that was used infrequently by many soldiers and whose pattern of use did not change. In the middle of the figure is use of a mouse, used daily by over half the soldiers in the initial survey and used daily by even more in the last survey. On the right is email usage. Here we also see an increase in frequency of use over time, but the overall frequency is less than mouse usage. Note that in 1999 about 20% of the soldiers never used email. Internet usage showed the same pattern as email. Similar patterns existed in the FORSCOM sample.

Computer Expertise

Results on the indices of computer expertise, self-ratings and icon test, were similar. Several trends are apparent, as illustrated in Figure 3. The first trend is the general ordering of the courses: IOBC, ANCOC, followed by BNCOC and OSUT. Clearly the IOBC soldiers perceived themselves as the most skilled. They outscored soldiers in each of the other groups on the icon test, except in year 2001 where their scores were equivalent to ANCOC. It should be noted that, although few soldiers could program in languages such as PASCAL or C++, the soldiers with those skills were typically in the IOBC. The ANCOC soldiers' self ratings were consistent with their icon scores, except in year 2001, where their icon scores seemed to justify a higher self-rating. BNCOC and OSUT were the lowest groups on self-ratings and

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icon scores. The second major trend is that the lowest groups improved most on these indices. The OSUT soldiers improved on both indices. The BNCOC soldier self-ratings increased in 2001, but their icon scores remained relatively constant over the three years.

For FORSCOM soldiers, the higher the enlisted rank, the higher the self-ratings and the higher the icon scores. In addition, officers had the highest self-ratings and highest icon scores. These results are consistent with the Infantry course profiles. In the FORSCOM samples, the officers rated themselves substantially higher than the other groups. Less than 10% of the officers considered themselves computer novices, compared to 35% of the most senior NCOs.

Special mention was made of differences in computer use by corporals/specialists on the battalion staff and those in the maneuver units, a difference that was probably a correlate of the opportunity to use computers as a staff member. This difference carried over to the self-ratings and icon scores, with those in the battalion staff scoring higher. In the battalion staff, 74% rated themselves above the novice level, while only 42% did so in the maneuver company. Similarly, those in the battalion staff averaged 60% correct on the icon test; those in the maneuver companies averaged 40% correct.

Lastly, there was a shift in the commercial software used over the three-year time period. The Microsoft world dominated in 2001 (Word, PowerPoint, Excel), whereas in 1999 other word processing, spreadsheet and presentation graphics programs were also cited.

Conclusions

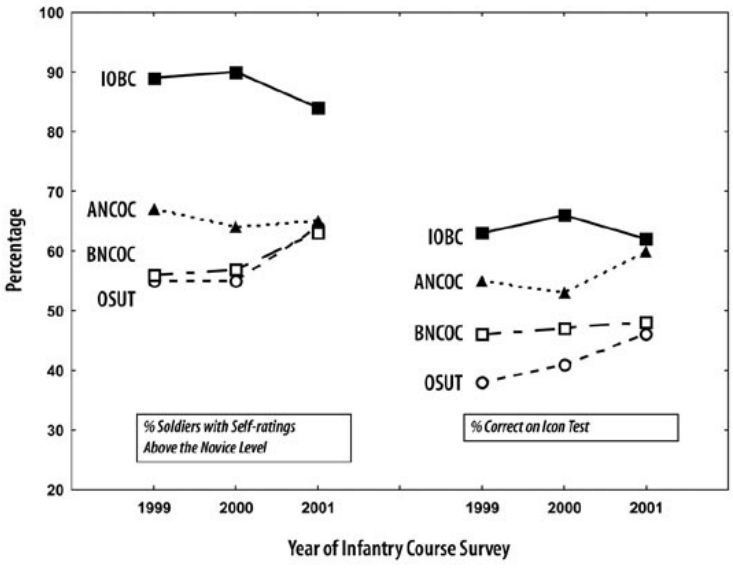
One of the remarkable outcomes of the trend analysis was the consistency in the findings.

- Consistent ordering by soldier rank on computer ownership, and on self-perceptions of skill and an objective index of computer expertise.
- Linear increase in percentage of soldiers using computers in high school over a 25-year time span.
- Gradual increase in email and Internet use.
- Gradual increase in computer experience—reflected in upward changes in self-perceptions and an objective index of expertise.
- Positive impact of the opportunity to use computers in a military environment upon perceived and actual expertise.

The soldier population is becoming more computer literate. But it would be a mistake to conclude that all subgroups within this population are equally proficient with computers, or that the youngest soldiers are the most proficient.

For additional information, please contact Dr. Dyer via E-mail at IFRU@ari.army.mil.

Figure 3. Self-ratings and icon test scores (Infantry course surveys).



What Commanders and Policy Makers need to know about AWOL and Desertion

Do deserters differ from other soldiers, and what are the consequences?

This Army Research Institute product is the first step in a year-long study of AWOL and desertion that was commissioned by the Army G-1. The purpose of the study is to provide Army leaders with new insights into why the desertion rate increased so dramatically in the last 6 years and what can be done to reduce the number of desertions. The first product from this effort is a short, user-friendly, self-contained summary of what Army research has contributed to the study of desertion. The change in the way that deserters are now processed within the Army has created a need for such information down at the company level, particularly by company commanders and re-enlistment NCOs.

Below is a brief summary of the report's findings in each of its key areas.

How big is the problem?
There has been a steady increase in the number of deserters from 1,509 in FY95 to 4,795 in FY01. Nearly 5,000 desertions are equivalent to losing a combat brigade each year. Not only does the loss of the soldiers hurt recruiting and manpower goals; it also leads to major personnel replacement costs.

How do deserters differ from other soldiers?
The research going back to World War II shows a consistent pattern. Compared to other soldiers, deserters are less educated, lower aptitude, and more likely to be from broken homes. Although the differences are not consistent enough to predict (and therefore prevent) desertion, they do suggest that if leaders pay closer attention to these kinds of soldiers, it may not only help the unit but also help reduce desertions.

Why do soldiers desert?
When asked why they left, deserters are most likely to mention personal, family, or financial problems or an inability to adapt to the demands of Army life. This pattern was not only noted during the Vietnam War but is also seen in today's deserters. Desertion is most likely to occur while the soldier is away from military control

(i.e., on leave or convalescent status or while in transit from one unit to another). There was some anecdotal evidence that desertions increase shortly after payday.

What are the main consequences of desertion for the Army and the deserter?
On average, it takes $38,000 to deliver a trained soldier to an operational unit. Return on this investment is lost when a soldier deserts. There are also adverse impacts on the unit (doing without needed manpower), the recruiting system (the absent individual needs to be replaced) and the AWOL soldier (e.g., fear of capture, loss of benefits, problems gaining and holding a good job).

What can be done to prevent desertion and/or reclaim the soldier who has deserted?
Although many (31% in one study) deserters want to be discharged, most are looking for some other remedy. In fact, many of the deserters in previous studies might not have become deserters if they had been able to be more articulate about their problems, allowing them to work them out without leaving the Army.

Some deserters leave the Army because they cannot adjust to Army demands and/or are trying to avoid punishment for illegal acts. Losing bad soldiers is not what really concerns the Army. It

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What Commanders and Policy Makers need to know about AWOL and Desertion

is the loss of soldiers who have the potential to be good soldiers. Initial observations and interviews with deserters and company commanders suggest that the most likely candidates for reintegration are those who (1) have a good pre-desertion record, (2) return voluntarily, (3) want to remain in the Army, (4) accept being punished for the AWOL, (5) have no (other) military or civilian infractions, (6) have a relatively short absence from the Army, and (7) have sufficient time remaining on their enlistment commitments.

The citation for the report is:

Ramsberger, P. F. & Bell, D. B. (2002). What We Know About AWOL and Desertion: A Review of the Professional Literature (Special Report 51). Alexandria, VA: U. S. Army Research Institute for the Behavioral and Social Sciences.

For additional information, please contact Dr. Bell via E-mail at SARU@ari.army.mil.

Training on the Web: Identifying and Authenticating Learners

Test design recommendations involves setting limits

The Army Training Support Center (ATSC) recognizeds that the increased use of computer technology for distributed learning systems might lead to future problems with online training and testing. There currently is no definitive evidence that compromise during online testing is a problem in the Army. However, the increased use of distributed learning coupled with reports of increased frequency of cheating among high school students is reason for concern. As a result, ATSC asked the Army Research Institute (ARI) to identify solutions to training compromise in online training environments.

Workshop Summary

In November 2001, ARI conducted a workshop titled "Training on the Web: Identifying, Authenticating, and Monitoring Learners". The workshop included presentations by experts in the field and concluded with a brainstorming session during which the participants generated potential solutions. Thirty-one individuals from industry, academia, and government attended. The presentations covered the following topics: a) training and testing design, where a course and its assessment can be designed to diminish the possibility of cheating; b) test security, explaining how the Educational Testing Service prevents and detects cheating; c) Public Key Infrastructure (PKI), a system to authenticate and secure transmission of information across the Internet using asymmetric encryption; d) biometrics, the process of identifying people based on their physical, personal, and/or behavioral characteristics; and e) military legal issues regarding training compromise, where cheating is a failure to follow a rule or regulation and, therefore, can be treated as misconduct. After the workshop, an Army advisory panel met to discuss final recommendations.

Recommendations

Based on the presentations and discussions, recommendations were developed. These recommendations are meant to function as general guidelines. The usefulness of any particular solution depends on the training situation. For example, the use of biometrics for identifying a learner might be appropriate for a course that covers sensitive material, but overkill for one that is a refresher of basic general knowledge.

Affirmative Obligations. Affirmative obligation statements involve presenting a statement that details appropriate and inappropriate behavior during a test. Learners are required to sign the statement or click on a "submit" or "accept" button on the monitor. The Army currently uses affirmative obligations for some online testing, as shown in Figure 1.

Proctoring. There are two types of proctoring: live and virtual. Live proctoring requires that students go to a specific location for monitoring by another person; virtual proctoring involves using technology to monitor students at remote locations.

Live proctoring is expensive but hard to beat for high stakes testing situations where the consequences of cheating and not knowing material are severe. For example, it is imperative that a heli-

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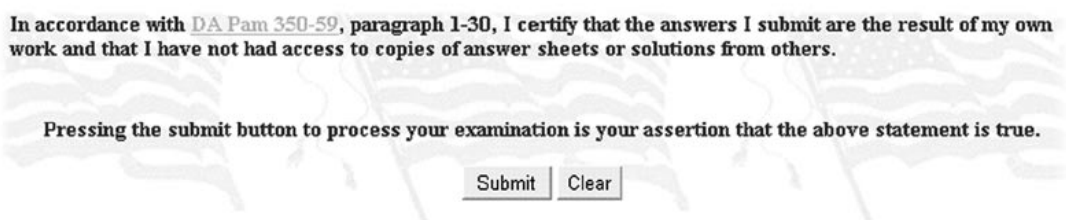
Figure 1. Affirmative obligation statement.



Training on the Web: Identifying and Authenticating Learners

copter mechanic is aptly qualified to identify and repair faulty parts. Within Army training, there are systems already in place that provide live proctoring, like the use of test security officers. Outside the Army, there are organizations that specialize in third party proctoring for test administration.

For virtual proctoring, the advisory panel recommends using a layered approach depending on the critical nature of the test. For example, with high stakes tests, video monitoring and a biometric measure such as iris scanning (see Figure 2.) may be used. For medium stakes tests, a single biometric measure may be acceptable. For low stakes tests, no proctoring measures may be needed. Alternatively, or in addition to biometrics, students can be asked biographical questions (e.g., last 4 digits of social security number or mother's maiden name) during testing to help verify their presence. The final virtual proctoring recommendation is to track keystrokes and the web sites visited by the test taker. This can provide evidence if cheating occurs and can also serve as a deterrent.

PKI. The use of PKI limits unauthorized access to tests and assurance that materials are not altered en route. PKI encryption could be adopted in Army training as it is adopted Army-wide.

Test design. The principal test design recommendation is to use performance-based testing, where the student must demonstrate performance proficiency. Successful completion of a performance-based test indicates that the test taker is able to perform the task, and pre-knowledge of test content becomes almost irrelevant. Other recommended design techniques are to randomize test items and use multiple forms. This reduces the utility of answer keys from previous tests.

The final set of test design recommendations involves setting limits. First, appropriate time limits can be set so test takers do not have time to complete the test plus look up answers in reference materials. Additional limits include restricting the number of times that a student can take a test and disabling computer "print/capture" options to reduce the possibilities of sharing test items with others.

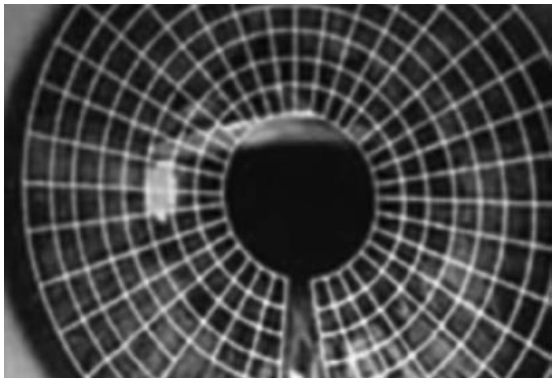


Figure 2. The features within each segment of the radial map are recorded, encoded, and can be easily transmitted or stored.

Conclusion

The study identified remedies to compromise in Web-based training and testing environments to implement without hindering learning and prior to any problems. It was the advisory panel's basic assumption and belief that soldiers generally will "do the right thing." The solutions, however, are meant to level the playing field, dissuading potential cheaters while not burdening those who never do.

The overall recommendation is a layered approach based on the criticality of the test under consideration. In some situations the use of biometrics, live proctoring, and encryption may be warranted, while in others only the use of a signed statement not to cheat may be enough. The level of security depends on multiple variables determined by a course administrator.

Additional Resources

The Biometrics Management Office (http://www.c3i.osd.mil/biometrics/) develops biometric policy and coordinates services within the DoD. As part of the Biometrics Management Office, the DoD Biometrics Fusion Center conducts biometric assessments.

For additional information, please contact Dr. Belanich or Dr. Wisher via E-mail at ATMRU@ari.army.mil.

Predicting the Retention of Proficiency at 16 Common Tasks

It is vital that soldiers learn these tasks well and remember them.

Common tasks are those every soldier should know, regardless of job or individual Military Occupational Specialty (MOS). All should be proficient at these tasks (for example, "Maintain an M16A1/M16A2 Rifle" and "Communicate by Tactical Radio"), because they may enable soldiers to survive and prevail in combat. It is vital that soldiers learn these tasks well and remember them.

In late July, 2001, the office of the Deputy Chief of Staff, Training and Doctrine Command (TRADOC) requested ARI's help with a skill retention problem involving such tasks. TRADOC asked ARI to predict how long already-trained soldiers can be expected to retain proficiency at the 16 common tasks that had been selected for the 2002 Common Task Test (CTT). In response, ARI applied a procedure prescribed in the User's Manual for Predicting Military Task Retention (ARI Research Product 85-26), as described below.

At Fort Eustis, Virginia, we conducted a structured group interview with three Drill Sergeants who were subject matter experts (SMEs) on the training and testing of the 16 tasks. As the first step in describing each task for us, they gave independently written answers to the questions shown in Table 1. The SMEs then defended and discussed their answers to each question in turn, until consensus was reached. In most cases, agreement was unanimous; in a few cases, it was necessary to settle for a 2-to-1 majority. We used these task data to generate a "procedural complexity" metric for each task. A table in the User's Manual allowed us to convert the procedural complexity score into a prediction of how long proficiency at the task will be retained.

Complications do happen. For example, the task "Operate an M16A1/M16A2 rifle" generated unexpectedly long discussion and conflicting predictions from different SMEs. There are, apparently, two ways to evaluate soldiers on this task. First, in an effort to conserve (and avoid the expense of) ammunition, soldiers are sometimes evaluated without actually firing their weapons. In this case, there is no time pressure, and the SMEs' description of the remaining aspects of the task yielded a prediction – from the User's Manual -- of a slow to moderate rate of decay. That is, the task should be easy to remember. The second method, however, involves actual shooting at pop-up targets, each of which is exposed for

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Table 1. Questions asked of the SMEs

1. Presence of Job Aids
Are job or memory aids used by the soldier in performing (and in the performance evaluation of) this task?
☐ Yes ☐ No

2. Quality of Job Aids
How would you rate the quality of the job or memory aid?
☐ Excellent ☐ Very Good ☐ Marginally Good ☐ Poor

3. Number of Steps
Into how many steps has the task been divided?
☐ 1 step ☐ 2 to 5 steps ☐ 6 to 10 steps ☐ More than 10 steps

4. Sequence Requirements
Are the steps in the task required to be performed in a definite sequence?
☐ None are ☐ Some are and some are not ☐ All are

5. Feedback
Does the task provide built-in feedback so that you can tell if you are doing each step correctly?
☐ Feedback for all steps ☐ Most steps (50% and above)
☐ Only a few steps (up to 50%) ☐ No built-in feedback

6. Time Requirement
Does the task or part of the task have a time limit for its completion?
☐ There is no time limit ☐ Easy-to-meet time limit ☐ Difficult time limit

7. Mental Requirements
How difficult are the mental processing requirements of this task?
☐ Almost none ☐ Simple ☐ Complex ☐ Very complex

8. Number of Facts
How many facts, terms, rules, or ideas must a soldier memorize in order to do the task?
☐ None ☐ A few (1-3) ☐ Some (4-8) ☐ Very many (more than 8)

9. Difficulty of Facts
How hard are the facts, terms, that must be remembered?
☐ Not applicable (none) ☐ Not hard at all ☐ Somewhat hard ☐ Very hard

10. Motor Control Requirements
What are the motor control demands of the task?
☐ None ☐ Small ☐ Considerable ☐ Very large

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only 3 seconds. In the User's Manual, this difficult time limit contributed heavily to the prediction that proficiency in this case will decay rapidly. We concluded that one must be cautious when scheduling refresher training for this task; it must be clear whether or not "operating" the rifle is defined to include actual rapid shooting.

One form of the predictions for the 16 common tasks is shown in Table 2. The right-hand column gives, for each task, the predicted interval before skill at the task is so decayed that only 70% of the soldiers retain proficiency. Figure 1 graphically illustrates these predictions, giving the percentage of soldiers expected to receive a "Go" if tested after a varying number of weeks without practice. You can see 1) what percentage of soldiers can be expected to be proficient after any given period of time since training or 2) how many weeks must elapse since training before that proficient percentage drops to any given level.

ARI's response to TRADOC's request, completed in just a few weeks, provided predictions of how quickly the different CTT tasks will decay. These predictions can be interpreted in terms of how frequently a unit of soldiers should receive refresher training on each task in order to maintain proficiency. In effect, the predictions show where TRADOC should put emphasis to increase efficiency in allocating training resources.

For additional information, please contact Dr. Sobol or Dr. Schaab via E-mail at ATMRU@ari.army.mil.

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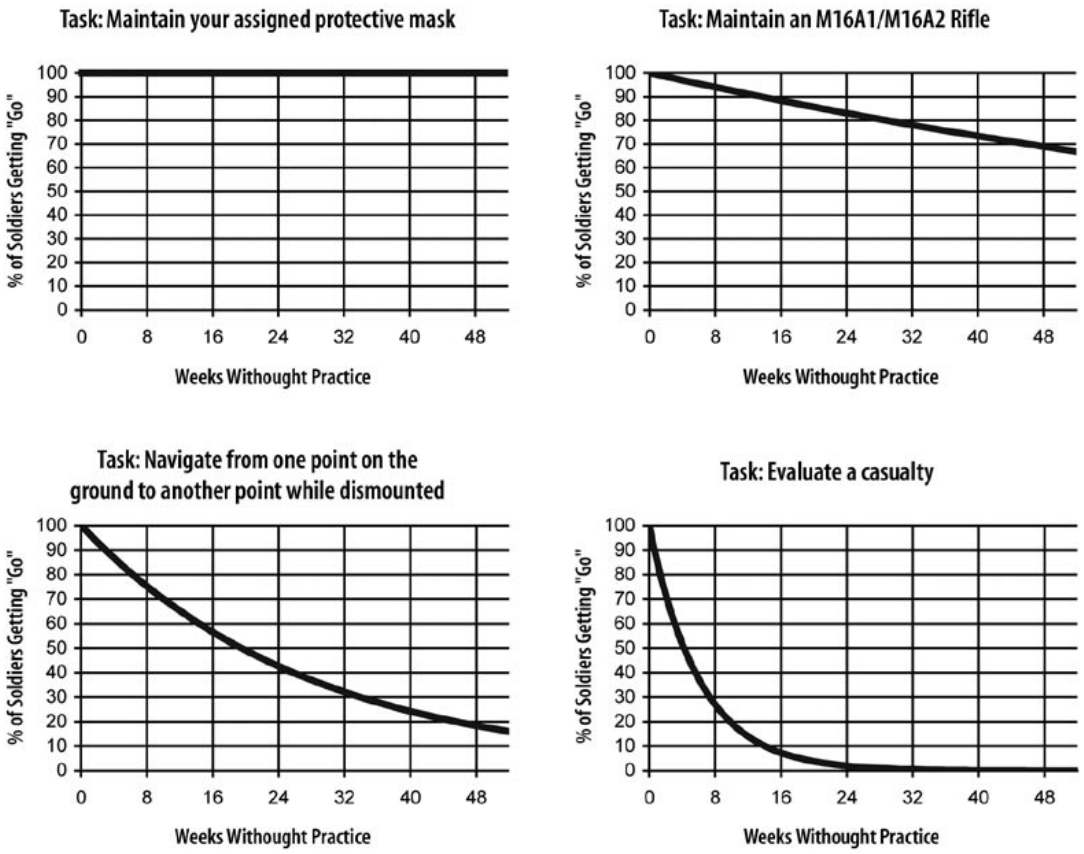
Table 2. Predicted retention for each task: number of weeks until proficiency decays to the point where only 70% of soldiers can receive a "Go"

Task Title	# of Weeks
Maintain Your Assigned Protective Mask	52+
Select Temporary Fighting Positions	52+
React to Direct and Indirect Fire	52+
Move Over, Through, Around Obstacles to Another Point While Dismounted	52+
Maintain an M16A1/M16A2 Rifle	52+
Decontaminate Self and Equipment Using Chemical Decontamination Kit	26
Communicate by Tactical Radio (Perform Voice Communications)	17
Move Under Direct Fire	10
Navigate from One Point on the Ground to Another Point While Dismounted	10
Protect Yourself From NBC Injury / Contamination with the Appropriate Mission Oriented Protective Posture (MOPP) Gear	8
Respond to Depleted Uranium/Low Level Radioactive Materials hazards	7
React To Chemical or Biological Hazard/ Attack	6
Protect Yourself from Chemical and Biological Injury/ Contamination Using Your Assigned Protective Mask	6
Operate an M16A1/M16A2 Rifle	4
Evaluate a Casualty	2
Perform First Aid to Prevent or Control Shock	2

Predicting the Retention of Proficiency at 16 Common Tasks

Figure 1. Sample of graphical representations of predicted retention of common tasks.



Survey Results and Their Impact on Personnel Matters

Examining personnel policies for the Army depend almost entirely on surveys to obtain their data.

The results of attitude and opinion surveys of soldiers have had significant impacts on Army personnel policies since World War II. It is – of course – difficult to link specific changes in a personnel policy to the findings of a survey. After all, survey results provide only a portion of the information Army leaders need in order to make informed decisions. That portion from survey results, though, is unique because a survey gives the soldier an opportunity to "tell it like it is" to the chain of command, all the way to the top.

Attitude and opinion surveys provide unique information because survey data have the following special combination of characteristics: quantifiable, valid, reliable, objective, comparable, relational, replicable, generalizable, inclusive, capable of indicating trends, and anonymous. In short, surveys provide the Army with a very efficient means of measuring what soldiers and their dependent family members think and do.

For the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), the survey method is an essential research tool for examining selection, assignment, classification, and training research as well as collecting information related to personnel policies and issues. Two offices within ARI – the Army Personnel Survey Office (APSO) and the Army Trends Analysis Group (ATAG) – depend almost entirely on surveys to obtain their data for use in examining Army personnel policies. APSO is responsible for approving and conducting surveys and for coordinating with DoD and the other Services. ATAG is responsible for examining the results of major surveys, identifying trends, and summarizing key findings for top Army leaders.

ARI is transforming its survey capabilities by fielding automated surveys using PCs, the Internet, and a web-site maintained by Army Knowledge Online (AKO). Web-based surveys have been conducted for the Army Chief of Staff, the Headquarters Department of the Army, Deputy Chief of Staff, G-1 and the U.S. Army Total Personnel Command. A special software program with automated reporting capabilities is being developed to facilitate web-based surveys on any Army web-site. In addition, the survey results will be reliable and accurately reported because of the controls embedded in the software capability.

Under ideal circumstances, web-based surveys will enable the Army to assess within days how well a new program or service is addressing agency, soldier or family needs. Candid reactions to policy options can be obtained overnight while guaranteeing anonymity.

Web-based surveys will contribute greatly to the Personnel Transformation taking place within the Army. First, however, soldiers must be willing to make AKO an essential element of their Army culture. To do this, soldiers have to check regularly their AKO email or have their AKO email forwarded to their work and/or home email addresses. Then, surveys can be conducted online throughout the world wherever soldiers have access to AKO.

Legacy from World War II

During World War II, America's best and brightest stepped forward to contribute to the Allies' war effort. Some served in combat on the front lines in the European and Pacific Theaters. Others made their contributions elsewhere in ways that capitalized on their unique skills and abilities.

At the U.S. War Department, a very select few used their social science skills, supported by that relatively new data collection tool – the attitude and opinion survey. Survey research pioneer Elmo Roper advised the Army Chief of Staff, General George C. Marshall, in April 1941 to make use of surveys to collect information from soldiers to guide military administration and policies. The list of the names of those in supporting roles in the Research Branch of the Morale Division reads like Who's Who in behavioral science, starting with Samuel A. Stouffer, lead author of The American

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Soldier. The findings of the four-volume work were based on the surveys done by the Research Branch to "provide a base of factual knowledge which would help the Director of the Army Information and Education Division [formerly the Morale Division] in his administrative and policy decisions."

Some of the survey questions asked during WW II addressed basic personnel matters, such as soldiers' expectations for promotion, job satisfaction and job assignments. Other questions directly addressed levels of morale after survey findings had indicated that units with the lowest levels of morale before entering combat had higher non-battle casualty rates during battle than did units with higher levels of morale. Another survey found that soldiers with three or more years of overseas duty were less likely than those with less than three years of service and no overseas duty to be willing to serve longer. Those soldiers with no prior overseas duty were willing to serve longer, regardless of number of years already served. One of the key outcomes of the survey work was obtaining soldiers' preferences in the development of the "point system," the basis for discharge after the war.

Personnel Survey of the Army/Sample Survey of Military Personnel

In 1943, General Marshall directed the Army to conduct the Personnel Survey of the Army to collect "data necessary to establish policy in the administration of all personnel in the Army." The first quarterly survey was conducted in December 1943. In 1958, the survey was renamed the Sample Survey of Military Personnel (SSMP). Now in its 59th year of service, the SSMP has been conducted continuously – sometimes three or four times a year, and now semi-annually. Unlike the surveys conducted during WW II, the SSMP has not been conducted in areas where soldiers were likely to be engaged in direct combat, such as in Korea, Vietnam and Southwest Asia.

At first, the Personnel Survey of the Army was largely used to collect demographic information, such as marital status, dependent children, and years of service. Near the end of WW II, the stated purpose of the survey was to provide "guidance in the establishment of War Department policies governing induction and appointment of new personnel in the Army, treatment of personnel as to assignment, promotion etc., while in the Army, and the orderly demobilization of personnel upon cessation of hostilities." Questions also were asked about number of awards/medals received, willingness to serve until the war in the Pacific Theater was won, and the impact of a pay raise on plans to remain in the Army.

In 1959, the first questions about assessment of leadership were included in the SSMP. The first racial conflict questions were used in 1973, and questions on sexual harassment were first included in 1981. Today, the SSMP continues as an omnibus survey, addressing in sets of a few questions the key topics identified by proponent agencies and activities in the Army. The SSMP is the Army's primary survey tool, "taking the pulse" of Active component soldiers each spring and fall, and reporting the findings to top Army leaders.

Army Personnel Survey Office

APSO conducts two Army-wide surveys on a recurring basis: the omnibus, semi-annual SSMP and the Survey on Officer Careers (SOC). Army agencies and activities identify specific topics to be included in these surveys, and the results are reported directly to these proponent organizations.

Sample Survey of Military Personnel (SSMP) – Annually, Spring and Fall

Although the SSMP can be used to assess one-time or emerging issues, its primary value is in tracking trends:

- Semi-annual tracking of morale, readiness, career intent plans to stay in or leave the Army, reasons for leaving the Army before retirement,

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aspects of job satisfaction, satisfaction with pay and benefits, satisfaction with aspects of the quality of Army life, career prospects for remaining in or leaving the Army, time away from duty station, spouse employment status, family adaptation to Army life, volunteering for combat and volunteering for Operation Other than War.

- Biennial or triennial tracking of other key concerns, such as reasons for joining the Army, military housing, Inspector General system, stress, and discrimination.

Survey on Officer Careers (SOC) – 1996, 1998, and 2000

The SOC was the Army's primary information source on why in the late 1990s captains were leaving the Army. The results were briefed to a number of senior Army leaders (identifying eroding retirement benefits, increased OPTEMPO and PERSTEMPO among the frequently mentioned reasons for leaving the Army early). Information on branch satisfaction was provided to the U. S. Army Cadet Command as part of their study on branch satisfaction by race and source of commission.

Impacts of Survey Results

With the aid of surveys, the Army has the capability to assess policy implementation, training needs and soldier and family attitudes, opinions, and behaviors in real time. As a result, personnel policy needs and implementation can be immediately assessed, enhancing soldier and family well-being – all of which will improve multidimensional readiness, soldier performance, and soldier retention.

Survey findings have been provided directly to sponsors/proponents, to special panels/committees/working groups and to the Army in the form of written reports, briefings, and citations in articles and publications, such as the annual Army Posture Statement, Army Times and Soldiers magazine. The results of surveys conducted by ARI have been used by the Army and DoD in support of testimony to the U.S. Congress. Survey findings and recommendations also have been briefed to top Army leaders, including the Secretary of the Army, the Under Secretary of the Army, the Army Chief of Staff, Deputy Chiefs of Staff at HQDA, and Major Command Commanders. Some examples of the use of survey results include:

- Retirement Benefits
  - ✔ SSMP—Reported to Congress in 1998 the increasing levels of dissatisfaction with retirement benefits among both the officer and enlisted corps. Also, reported in the Army Posture Statement for Congress.
  - ✔ Survey on Officer Careers (SOC)—Reported to Congress the increasing dissatisfaction of company grade officers with retirement benefits.
- Command Declination. Special telephone survey and focus group interviews conducted for the DCS, G-1 on why Colonels and Lieutenant Colonels were declining commands at the brigade and battalion levels. Key findings: Too little or no flexibility in the command slating process; family concerns are more important; want to have an option during the selection/slating process to decline a command without prejudice.
- Command Selection and Slating Process. Special Internet, web-based survey conducted for the DCS, G-1 of current brigade and battalion commanders. Key findings: Seven-tenths reported they were satisfied with the command slating process and that they received their first, second or third choice stated on their Preference Sheet; four-fifths were satisfied with the amount of time they had to decide whether to accept (or decline) the slated command; almost one-half believe the 14-22 months process for assuming command is "too long" but slightly more believe the amount of time is "about right"; three-fifths believe officers should be allowed to rank order only those commands for which they consider themselves to be "fully qualified."

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- Officer Evaluation Report (OER), Counseling, and Leader Development Survey. Special Internet, web-based survey conducted for the DCS, G-1 of current brigade and battalion commanders. Key findings: almost all believe the current OER system will be effective in managing Senior Rater profiles; slightly over one-half believe the OER system will be effective for ensuring the best officers get promoted, that a rated officer's potential will be accurately reported, and the rating accurately reflects an officer's job performance; and less then three-tenths believe the OER system will be effective in counseling officers on what they need to do to become high performing officers, communicating to officers what they need to do to meet their performance objectives, and providing rated officers with leader development.
- Enlisted Personnel Management System (EPMS) XXI Survey. Special survey conducted for U.S. Army Total Personnel Command, Enlisted Personnel Management Directorate as part of a precursor study assessing whether the EPMS needed to be revamped. Study results indicated that major changes to the EPMS were not required at that time.
- Personnel Tempo (PERSTEMPO). SSMP tracking results indicated that, generally, soldiers' attitudes about the Army, actual intentions to remain in the Army, morale, stress levels, and job satisfaction do not appear to be effected by the number of weeks away from their duty stations PERSTEMPO. What does seem to be affected is reported satisfaction/dissatisfaction with the "amount of time separated from the family." These differences typically become apparent when the soldier has been away from the duty station 13 or more weeks.
- Women in the Army. SSMP tracks for Human Resources Policy Directorate, DCS, G-1, changes in attitudes toward women in the Army. Key findings: female soldiers are more positive than male soldiers about the capabilities of women in the Army; there have been significant increases in males' positive attitudes about taking orders from a female soldier and the impact of mixed gender units on unit cohesion and work atmosphere. Males in combat service support specialties – who are much more likely to have females assigned to their units – are the most positive about women in the Army.
- Survey of Army Families I, II, III and IV. These surveys were conducted for the U.S. Army Community and Family Support Center (CFSC) among the non-military spouses of Active component soldiers. Each survey collects information on family member attitudes about the Army way of life and quality of life for Army families. It also tracks trends in the characteristics of Army families, identifies new and emerging family issues, assesses programs in resolving Army Family Action Plan issues, and supplements other studies of Army families. Key findings: slightly more than one-half of spouses are satisfied with the Army as a way of life and one-fifth are dissatisfied; about one-third are satisfied and one-third are dissatisfied with the support and concern the Army has for families and for the support and concern of leaders in the soldier's unit.

Conclusion

Through its two recurring surveys – the SSMP and SOC – as well as special surveys, the Army Personnel Survey Office continues to provide current and trend information that Army leaders can use to track personnel policies and issues and to assess emerging issues.

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Instructional Technology in Helicopter Flight Training: What a Difference a Decade Makes

The evolution of the microprocessor (computer chip) has revolutionized simulation technology. The simulator bay of the 1990s, with its rows of cabinets housing the image generator (IG) electronics, and large, heat-generating light valve-based visual display systems, appears almost vacant today. Most of the cabinets housing the electronics have disappeared, replaced by PC-based electronics that take up far less space. A decade or so ago, it was difficult to think about a full-mission simulator without a complex six-degree of freedom motion platform; today, new generation simulators are appearing without motion systems, or with simpler, more cost-effective force cueing systems (for example, the pneumatic g-seat). All of this leads to the question: just what do we need to train Army aviators? Must we be constantly chasing the will-o'-the-wisp of advancing technology, which we are destined never to catch? Does successful training depend more upon technology or the instructional strategies employed?

Over the past decade a lot has been invested in simulator technology. Training technology, by contrast, has received much less attention. The assumption has been that what is needed most is "high fidelity," meaning the ability to create the illusion of flight. The institutional culture has shared the belief that the greater the fidelity of a simulator, the more effective the training. Yet the scientific evidence does not support this belief and more recent work has shown that the same results can often be achieved with simulators of lower "fidelity."

This preoccupation with "fidelity" has created a situation where aviation training organizations worry more about the future obsolescence of simulators and less about how to use them as training devices (or how to determine the quality of what is learned in them). The result is an imbalance in aviation training technology: increasingly sophisticated simulators, coupled with instructional strategies that have undergone little change. Before deciding whether to upgrade the simulator, it would be preferable to determine whether or not its present utilization is optimal. If the instructional program is a holdover from the days when all training took place in the aircraft, then chances are, its potential is not being realized.

The question remains, what do we need to insure optimal use of these high-tech simulation assets, which in some cases cost more than the aircraft that they simulate?

Unfortunately, answers are not easily obtained, especially for helicopter training, which represents a small segment of the aviation community. The Army Research Institute Field Unit at Fort Rucker, Alabama, officially called the Rotary Wing Aviation Research Unit (RWARU) is one of the few research organizations that has attempted to address issues related to this question.

ARI research has shown that effective simulators, for primary visual and instrument training, need not cost millions of dollars. The first set of experiments showed that an existing instrument simulator, the Synthetic Flight Training System (SFTS) could be converted into a visual flight simulator, with the addition of low-cost IGs and high-resolution video monitors. Thus, a simulator used only for instrument training could also be used for the primary phase of visual flight training.

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Does successful training depend more upon technology or the instructional strategies employed?

Two student pilots prepare for an instrument flight training session in the Frasca 342 PC-based simulator. Note visual display projectors mounted on top of cockpit.

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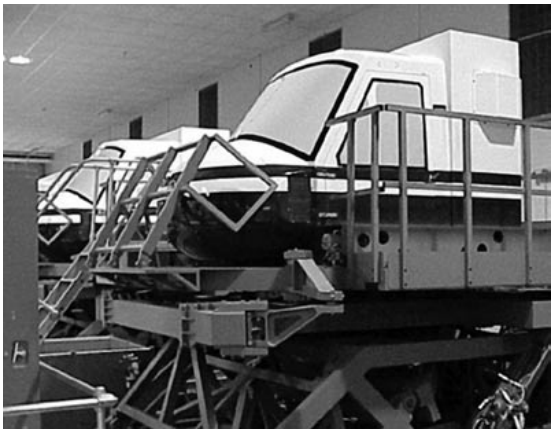

SFTS (2B24) instrument training simulators located at Fort Rucker, AL.

A more recent ARI study demonstrated how a low-cost PC-based simulator, using Pentium 75 technology, could train primary student pilots in basic and advanced instrument skills as effectively as the SFTS, which, incidentally, was mounted on a motion platform. This research was unique when compared to most transfer of training studies. Student pilots were not simply pretrained in a simulator and compared to those trained only in the aircraft. This was impossible since the Army already uses a non-visual, motion-base simulator for instrument training. Instead, the research was imbedded in the Initial Entry Rotary-Wing (IERW) Instrument Phase curriculum. Student pilots were randomly assigned to either the Frasca 342 low-cost simulator or to the currently-operational Synthetic Flight Training System (SFTS). They then completed the full 30 hours of simulator training, after which they went to the flightline to complete the final 20 hours of training in the TH-67 primary training helicopter. Times to proficiency and checkride evaluations showed no significant differences between the Frasca 342 and the 30-year-old SFTS, though students trained in SFTS were more likely to report that training in it had hindered their performance in the aircraft. Of the total 38 students who participated in the study, none were eliminated from training or set back to a later class because of poor performance. This field experiment showed that the cheaper, more reliable simulators available now can get the job done just as well as their more complex, expensive, and less reliable predecessors. So do we need a full motion platform, with its complicated hydraulics which are expensive to maintain, if all we want to do is train instrument skills? From the results of the ARI research, the answer to this question is no.

Utility assessments like this are still the exception, not the rule. Simulators are still acquired at high cost and their training effectiveness is assumed. First the hardware is acquired, then it is decided how it will be used for training. Training, unfortunately, is the weakest link, the crack in the foundation upon which the multimillion-dollar simulator sits.

The fundamental mistake that is made when new simulators are acquired is the relative disregard for imbedding training feedback and measurement technology in the devices. Consequently, a new simulator may be acquired with high-end visuals and full motion cueing, yet no effective means of accurately measuring its training effectiveness. Do student pilots learn faster in the new device than they did in its predecessor? There is no way of knowing. Instructors will continue to use the traditional grade slips, which do not provide sufficient range to distinguish stellar from mediocre performers. Without more precise performance measures, it is nearly impossible to assess how effective the simulator is, or if the trainers are using it effectively.

If we find that off loading X number of hours from aircraft to simulator does not save much training time in the aircraft, then does this mean that the simulator is not effective and must be replaced or upgraded? No, this is seldom the case. What's "broken" more often than not, is not the simulator, but the training program supporting it. In fact, a lot of research shows that even low-fidelity simulators can be training-effective, in that what is trained in them can transfer to the aircraft. There

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are few simulation training programs with simulation-focused syllabi that have not been shown to be effective. It is well within the capabilities of the current technology to develop proficiency-based training programs, in which the student performs a specified flight task until demonstrating mastery, then moves on to a higher rung on the proficiency ladder. If mastery is not demonstrated on an evaluation, the student will repeat the task until the evaluation is passed. This type of training technology requires one other thing: automated, objective measures of performance, which, in most instances, are not used at the present time. The data captured by such a system could be analyzed and scored real-time, or offline. The first step in its development and validation would be tying individual measures to published objectives for maneuvers.

These are spelled out in the Army Aircrew Training Manual for each aircraft type. For example, while hovering, the pilot should not allow the aircraft to drift more than three feet in any direction and should maintain an altitude of five feet, plus or minus one foot. Likewise, heading deviations "the direction of which the nose of the aircraft is pointing" should be less than + or - 10°. These parameters could be measured continuously and evaluated after the training session; or, preferably, a scoring algorithm could automatically generate a numerical score upon completion of the maneuver task. The use of a scoring algorithm would eliminate the subjectivity that is an inherent part of grading. It would also provide a means of providing feedback to the student for each iteration of a maneuver.

It is clear that the future success of aviation training will depend upon the development of more objective measures of performance than currently exist. Training experts likewise should not become fixated on the ever-changing technology of simulation. Having a tool is one thing, using it properly is another. The technologies discussed in this article are currently available. The challenge to ARI is to develop and demonstrate methodologies which have both practicality and utility. This will require effective communication and coordination with the U.S. Army Aviation Center, in order to realize the goals of Flight School XXI.

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